Appendix B

PISCES-MP Direct Solver Results

This appendix lists the overall runtimes of the PISCES-MP linear solver presented in Chapter 4. To maintain an application-oriented perspective, it is important to note the relative importance of the direct solver within the application. For this reason, the matrix formation times are also listed. The matrix formation time includes the time taken by PISCES to create the initial matrix as well as the time taken to map these non-zero values into the sparse matrix data structure (i.e., assemble the matrix).

Table B.1 IBM RS6000/560 solution times.

	Form Time	Factor Time	Solve Time
2K CMOS Inverter	1.24s	0.58s	0.07s
8K CMOS Inverter	12.64s	8.63s	0.67s
11K CMOS Inverter	21.06s	13.05s	0.98s
18K CMOS Inverter	34.73s	37.87s	2.21s
6K Bipolar Transistor	6.25s	5.22s	0.38s
6K Photo-Emitter	4.17s	0.72s	0.06s

Table B.2 SP1 bipolar transistor solution times.

	Form Time	Factor Time	Solve Time
1PE	6.25s	5.22s	0.38s
2PE	3.15s	2.71s	0.20s
4PE	1.61s	1.89s	0.12s
8PE	0.87s	1.25s	0.09s
16PE	0.54s	0.98s	0.07s

Table B.3 SP2 bipolar transistor solution times.

	Form Time	Factor Time	Solve Time
1PE	3.63s	2.92s	0.23s
2PE	1.81s	1.54s	0.12s
4PE	0.91s	1.13s	0.07s
8PE	0.47s	0.80s	0.05s
16PE	0.27s	0.67s	0.04s
32PE	0.17s	0.60s	0.03s

Table B.4 iPSC/860 2k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	8.45s	3.11s	0.28s
2PE	4.46s	1.61s	0.15s
4PE	2.69s	1.35s	0.13s
8PE	1.78s	1.10s	0.09s
16PE	1.26s	1.10s	0.08s
32PE	0.92s	1.15s	0.10s

Table B.5 iPSC/860 8k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
8PE	10.40s	8.84s	0.60s
16PE	5.78s	7.84s	0.52s
32PE	3.39s	6.00s	0.47s

Table B.6 iPSC/860 11k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
8PE	11.39s	14.40s	1.13s
16PE	7.02s	12.98s	0.89s
32PE	4.48s	10.43s	0.71s

Table B.7 SP1 2k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	1.24s	0.58s	0.07s
2PE	0.62s	0.29s	0.04s
4PE	0.30s	0.23s	0.03s
8PE	0.16s	0.15s	0.02s
16PE	0.10s	0.14s	0.02s

Table B.8 SP1 8k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	12.64s	8.63s	0.67s
2PE	6.46s	4.44s	0.35s
4PE	3.38s	2.31s	0.19s
8PE	1.85s	1.28s	0.12s
16PE	1.35s	1.07s	0.09s

Table B.9 SP1 11k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	21.06s	13.05s	0.98s
2PE	10.31s	6.65s	0.52s
4PE	5.77s	3.44s	0.28s
8PE	2.93s	2.06s	0.18s
16PE	1.70s	1.77s	0.15s

Table B.10 SP1 18k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	34.73s	37.87s	2.21s
2PE	17.16s	19.16s	1.12s
4PE	8.88s	9.88s	0.73s
8PE	5.47s	5.22s	0.48s
16PE	3.01s	3.96s	0.30s

Table B.11 SP2 2k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	0.80s	0.29s	0.04s
2PE	0.41s	0.15s	0.02s
4PE	0.21s	0.11s	0.01s
8PE	0.11s	0.09s	0.00s
16PE	0.07s	0.08s	0.00s
32PE	0.05s	0.09s	0.00s

Table B.12 SP2 8k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	4.46s	2.67s	0.26s
2PE	2.27s	1.40s	0.13s
4PE	1.17s	1.12s	0.07s
8PE	0.59s	0.59s	0.04s
16PE	0.34s	0.46s	0.03s
32PE	0.21s	0.37s	0.03s

Table B.13 SP2 11k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	6.23s	4.20s	0.37s
2PE	3.19s	3.20s	0.19s
4PE	1.61s	1.44s	0.11s
8PE	0.83s	0.94s	0.06s
16PE	0.48s	0.83s	0.05s
32PE	0.28s	0.73s	0.04s

Table B.14 SP2 18k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
1PE	11.36s	11.08s	0.76s
2PE	5.74s	5.93s	0.39s
4PE	2.91s	3.55s	0.21s
8PE	1.50s	2.29s	0.12s
16PE	0.84s	1.68s	0.09s
32PE	0.48s	1.39s	0.07s

Table B.15 CM-5E 2k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
32PE	1.18s	0.51s	0.06s
64PE	0.82s	0.82s	0.08s

Table B.16 CM-5E 8k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
32PE	4.63s	3.47s	0.25s
64PE	2.89s	2.23s	0.18s

Table B.17 CM-5E 11k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
32PE	6.69s	5.77s	0.63s
64PE	4.31s	4.06s	0.37s

Table B.18 CM-5E 18k grid CMOS inverter solution times.

	Form Time	Factor Time	Solve Time
32PE	10.14s	7.81s	0.58s
64PE	6.54s	5.38s	0.32s

Table B.19 SP1 6k grid photo-emitter solution times.

	Form Time	Factor Time	Solve Time
1PE	4.17s	0.72s	0.06s
2PE	2.12s	0.38s	0.04s
4PE	1.10s	0.21s	0.02s
8PE	0.59s	0.14s	0.01s
16PE	0.34s	0.11s	0.01s

Table B.20 SP1 56k grid photo-emitter solution times.

	Form Time	Factor Time	Solve Time
4PE	2.58s	4.26s	0.26s
8PE	1.32s	2.21s	0.15s
16PE	0.68s	1.17s	0.09s

Table B.21 SP1 112k grid photo-emitter solution times.

	Form Time	Factor Time	Solve Time
8PE	4.86s	8.81s	0.61s
16PE	2.51s	4.67s	0.42s

Table B.22 SP2 6k grid photo-emitter solution times.

	Form Time	Factor Time	Solve Time
1PE	1.83s	0.45s	0.05s
2PE	0.98s	0.28s	0.04s
4PE	0.51s	0.21s	0.03s
8PE	0.28s	0.11s	0.02s
16PE	0.20s	0.07s	0.02s
32PE	0.16s	0.10s	0.02s

Table B.23 SP2 56k grid photo-emitter solution times.

	Form Time	Factor Time	Solve Time
4PE	1.52s	2.11s	0.15s
8PE	0.79s	1.04s	0.08s
16PE	0.44s	0.53s	0.05s
32PE	0.28s	0.28s	0.03s
64PE	0.17s	0.16s	0.02s

Table B.24 SP2 112k grid photo-emitter solution times.

	Form Time	Factor Time	Solve Time
8PE	2.18s	3.95s	0.25s
16PE	1.15s	2.00s	0.13s
32PE	0.62s	1.05s	0.07s
64PE	0.34s	0.56s	0.04s
128PE	0.20s	0.34s	0.02s

Table B.25 SP2 512k grid photo-emitter solution times.

	Form Time	Factor Time	Solve Time
16PE	20.45s	40.04s	1.91s
32PE	10.75s	20.11s	0.92s
64PE	6.08s	11.10s	0.48s
128PE	3.39s	7.73s	0.34s